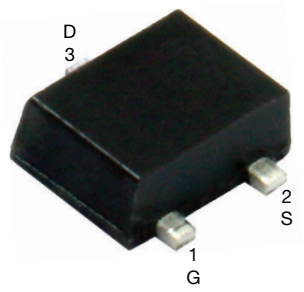
# P-Channel 20 V (D-S) MOSFET

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{DS}$ (V) | $R_{DS(on)}$ (Ω) | $I_D$ (A) | $Q_g$ (TYP.) (nC) |
| -20 | 0.760 at $V_{GS}$ = -4.5 V | -0.45 | 1 |
| | 1.040 at $V_{GS}$ = -2.5 V | -0.40 | |
| | 1.500 at $V_{GS}$ = -1.8 V | -0.32 | |

SC-89 (3 leads)




Top View

## FEATURES

- TrenchFET® power MOSFET
- 100 % $R_g$ tested
- Typical ESD protection: 1000 V (HBM)
- Fast switching speed
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

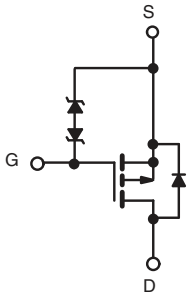
Pb-free

RoHS COMPLIANT

HALOGEN FREE

## APPLICATIONS

- Load / power switch for portable devices
- Drivers: relays, solenoids, displays
- Battery operated systems




P-Channel MOSFET

**Marking Code**: 6

**Ordering Information**:
Si1013CX-T1-GE3 (Lead (Pb)-free and Halogen-free)

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C, unless otherwise noted) | | | | |
|---|---|---|---|---|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Drain-Source Voltage | | $V_{DS}$ | -20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 8 | |
| Continuous Drain Current ($T_J$ = 150 °C) | $T_A$ = 25 °C | $I_D$ | -0.45 [b, c] | A |
| | $T_A$ = 70 °C | | -0.36 [b, c] | |
| Pulsed Drain Current (t = 300 µs) | | $I_{DM}$ | -1.5 | |
| Continuous Source-Drain Diode Current | $T_A$ = 25 °C | $I_S$ | -0.16 [b, c] | |
| Maximum Power Dissipation | $T_A$ = 25 °C | $P_D$ | 0.19 [b, c] | W |
| | $T_A$ = 70 °C | | 0.12 [b, c] | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55 to +150 | °C |

| THERMAL RESISTANCE RATINGS | | | | | |
|---|---|---|---|---|---|
| PARAMETER | | SYMBOL | TYPICAL | MAXIMUM | UNIT |
| Maximum Junction-to-Ambient [a, b] | t ≤ 5 s | $R_{thJA}$ | 440 | 530 | °C/W |
| | Steady State | | 540 | 650 | |

**Notes**

a. Maximum under steady state conditions is 650 °C/W.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.



For technical questions, contact: pmostechsupport@vishay.com

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| **SPECIFICATIONS** ($T_J$ = 25 °C, unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{DS}$ | $V_{GS}$ = 0, $I_D$ = -250 µA | -20 | - | - | V |
| $V_{DS}$ Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D$ = -250 µA | - | -12 | - | mV/°C |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | | - | 1.8 | - | |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = -250 µA | -0.4 | - | -1 | V |
| Gate-Source Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 8 V | - | - | ± 30 | µA |
| | | $V_{DS}$ = 0 V, $V_{GS}$ = ± 4.5 V | - | - | ± 1 | |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -20 V, $V_{GS}$ = 0 V | - | - | -1 | |
| | | $V_{DS}$ = -20 V, $V_{GS}$ = 0 V, $T_J$ = 85 °C | - | - | -10 | |
| On-State Drain Current [a] | $I_{D(on)}$ | $V_{DS}$ = ≥ 5 V, $V_{GS}$ = -4.5 V | -1.5 | - | - | A |
| Drain-Source On-State Resistance [a] | $R_{DS(on)}$ | $V_{GS}$ = -4.5 V, $I_D$ = -0.4 A | - | 0.630 | 0.760 | Ω |
| | | $V_{GS}$ = -2.5 V, $I_D$ = -0.2 A | - | 0.865 | 1.040 | |
| | | $V_{GS}$ = -1.8 V, $I_D$ = -0.1 A | - | 1.200 | 1.500 | |
| Forward Transconductance | $g_{fs}$ | $V_{DS}$ = -10 V, $I_D$ = 0.4 A | - | 1 | - | S |
| **Dynamic [b]** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = -10 V, $V_{GS}$ = 0 V, f = 1 MHz | - | 45 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 15 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 10 | - | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = -10 V, $V_{GS}$ = -4.5 V, $I_D$ = -0.4 A | - | 1.65 | 2.50 | nC |
| | | $V_{DS}$ = -0 V, $V_{GS}$ = -2.5 V, $I_D$ = -0.4 | - | 1 | 2 | |
| Gate-Source Charge | $Q_{gs}$ | | - | 0.2 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 0.26 | - | |
| Gate Resistance | $R_g$ | f = 1 MHz | 2.4 | 12 | 24 | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = -10 V, $R_L$ = 33.3 Ω<br>$I_D$ ≅ -0.3 A, $V_{GEN}$ = -4.5 V, $R_g$ = 1 Ω | - | 9 | 18 | ns |
| Rise Time | $t_r$ | | - | 10 | 20 | |
| Turn-Off DelayTime | $t_{d(off)}$ | | - | 10 | 20 | |
| Fall Time | $t_f$ | | - | 8 | 16 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = -10 V, $R_L$ = 33.3 Ω<br>$I_D$ ≅ -0.3 A, $V_{GEN}$ = -8 V, $R_g$ = 1 Ω | - | 1 | 2 | |
| Rise Time | $t_r$ | | - | 8 | 16 | |
| Turn-Off DelayTime | $t_{d(off)}$ | | - | 9 | 18 | |
| Fall Time | $t_f$ | | - | 5 | 10 | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Pulse Diode Forward Current [a] | $I_{SM}$ | | - | - | -1.5 | A |
| Body Diode Voltage | $V_{SD}$ | $I_S$ = -0.3 A | - | -0.8 | -1.2 | V |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = -0.3 A, dI/dt = 100 A/µs | - | 16 | 24 | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | - | 8 | 16 | nC |
| Reverse Recovery Fall Time | $t_a$ | | - | 11 | - | ns |
| Reverse Recovery Rise Time | $t_b$ | | - | 5 | - | |

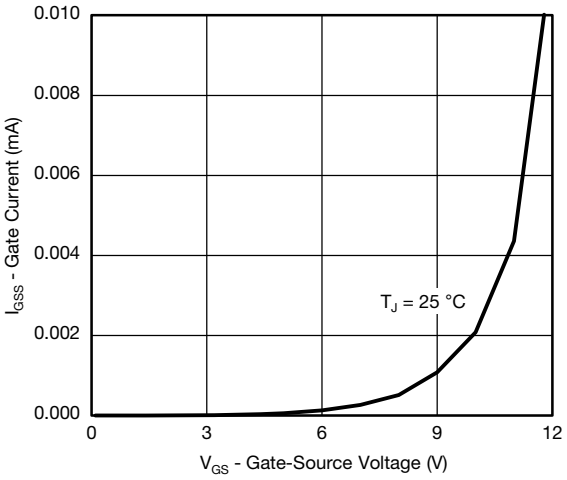
**Notes**

a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

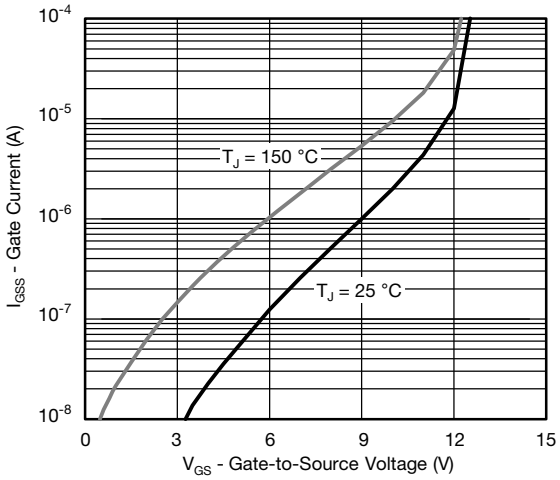
*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*


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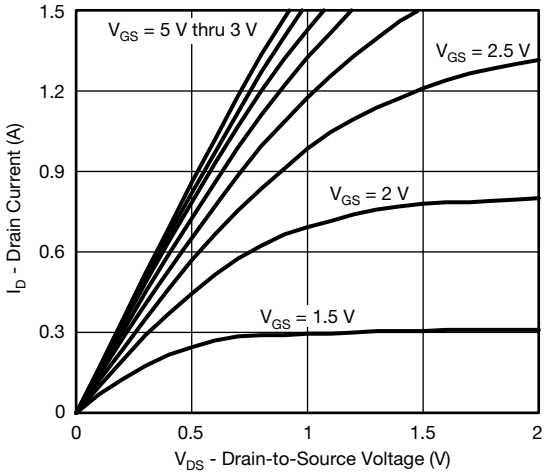
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



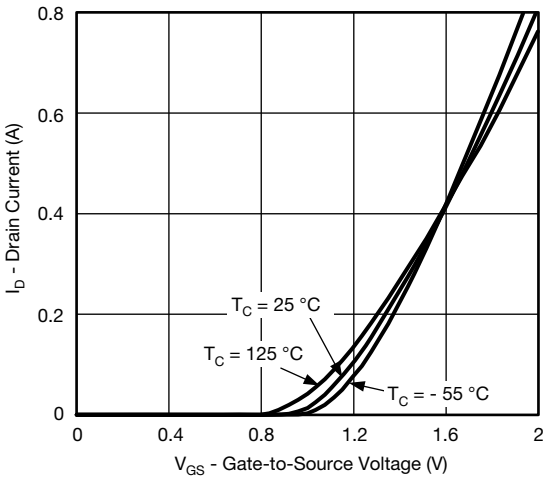

**Gate Current vs. Gate-Source Voltage**



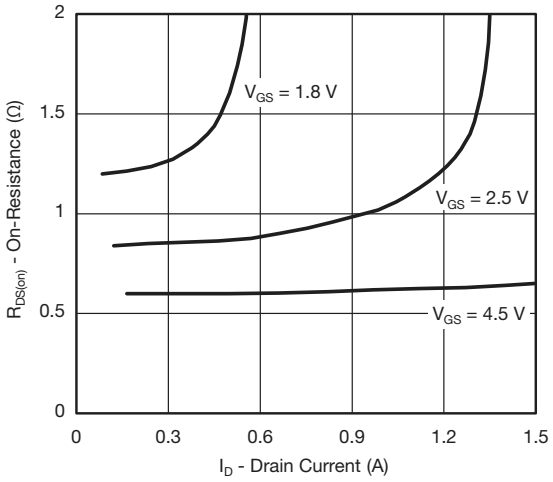

**Gate Current vs. Gate-Source Voltage**



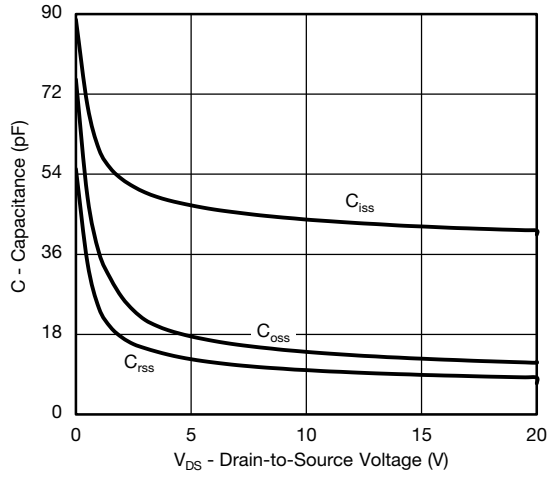

**Output Characteristics**




**Transfer Characteristics**



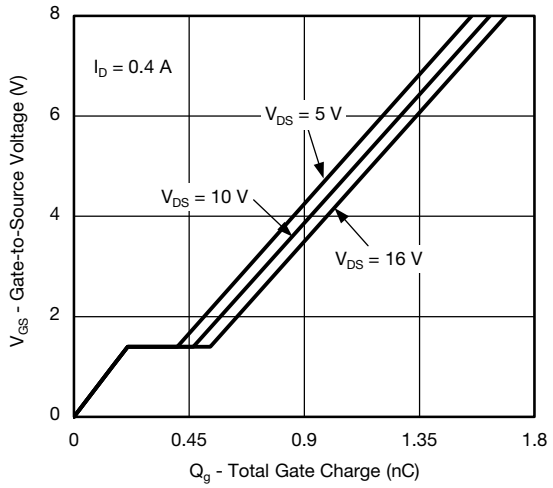

**On-Resistance vs. Drain Current**



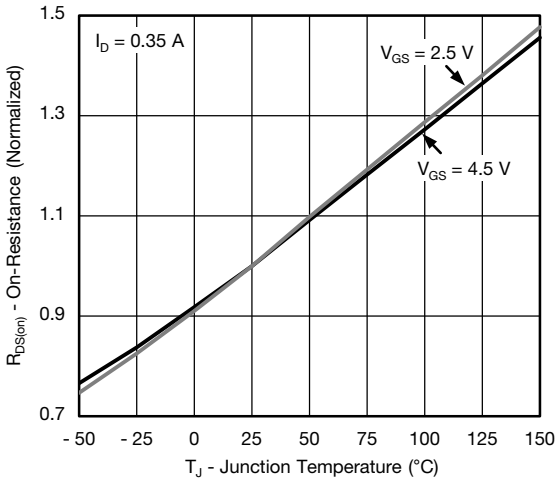

**Capacitance**


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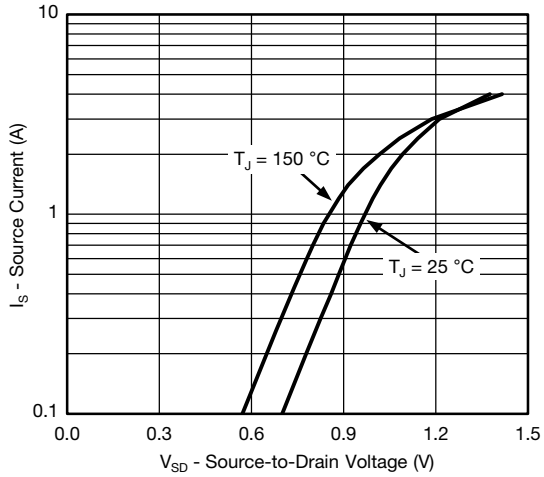
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



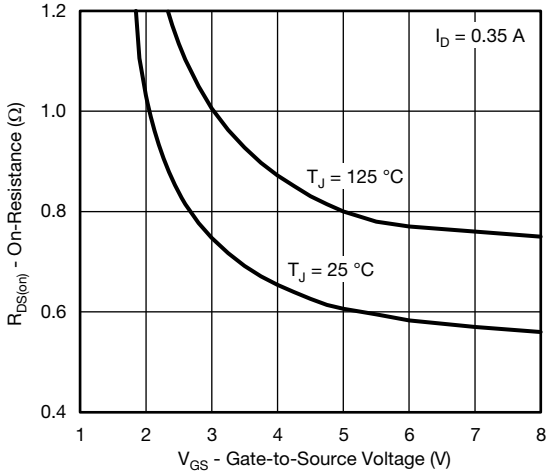

**Gate Charge**



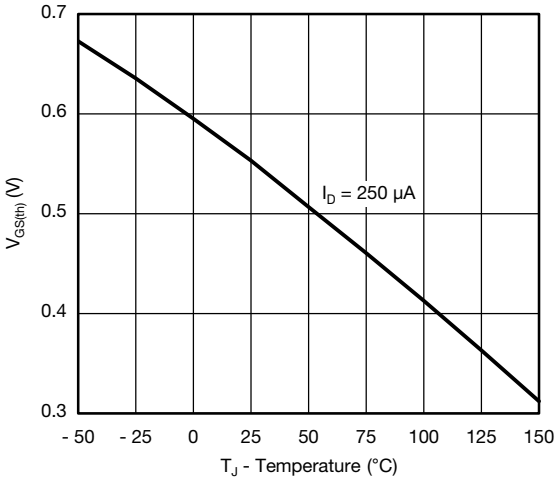

**On-Resistance vs. Junction Temperature**



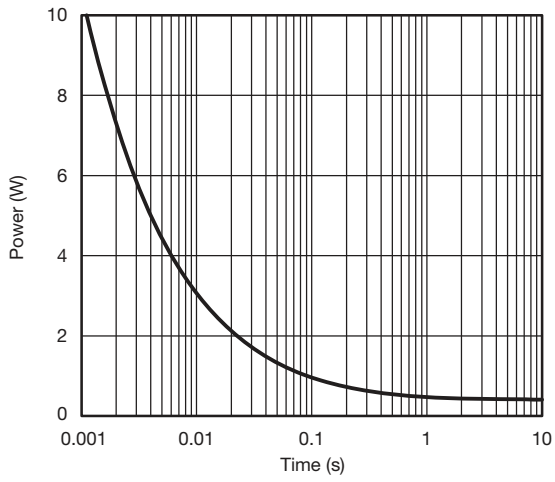

**Source-Drain Diode Forward Voltage**




**On-Resistance vs. Gate-to-Source Voltage**



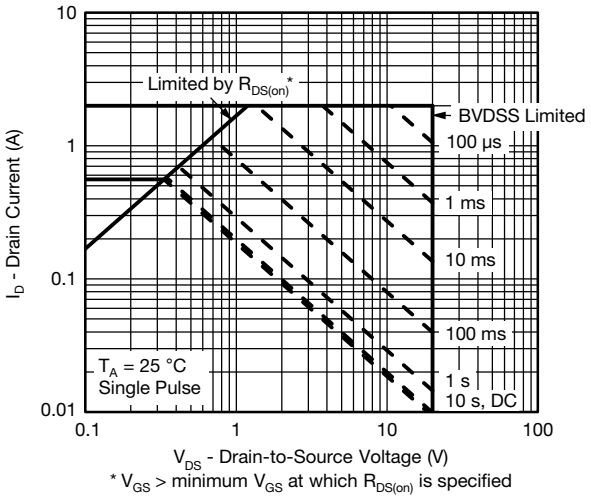

**Threshold Voltage**



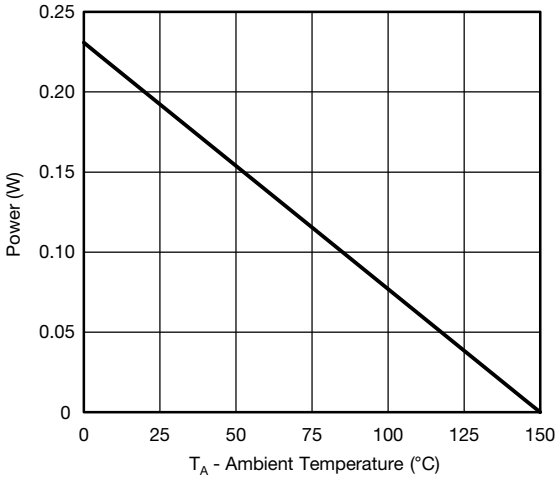

**Single Pulse Power, Junction-to-Ambient**


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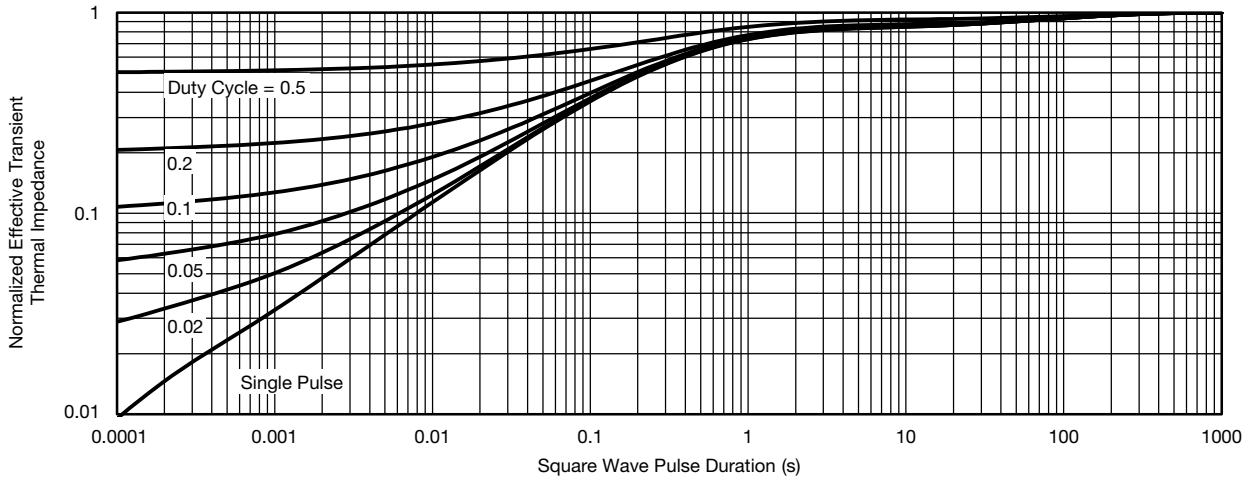
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)




**Safe Operating Area, Junction-to-Ambient**




**Power Derating, Junction-to-Ambient**




**Normalized Thermal Transient Impedance, Junction-to-Ambient**

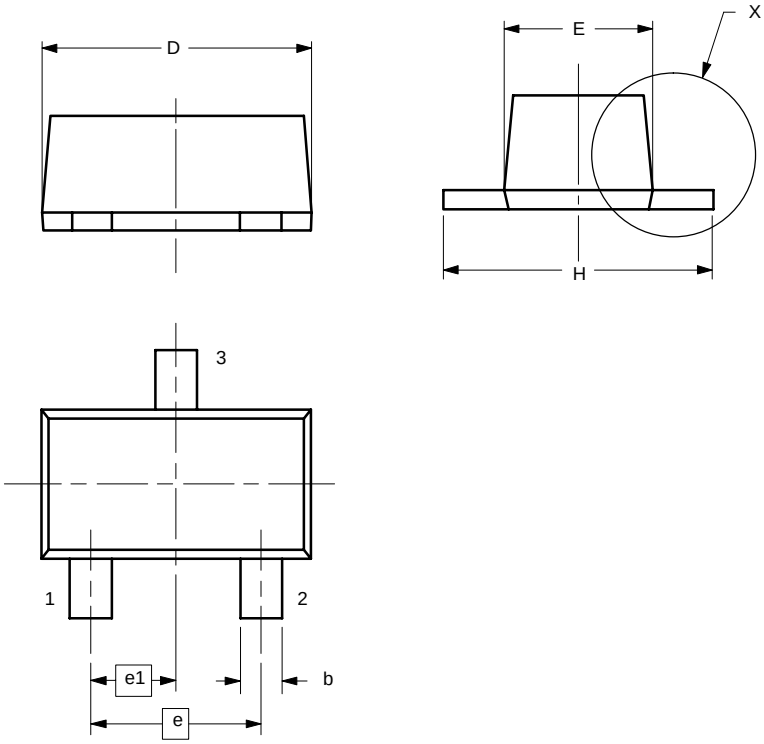
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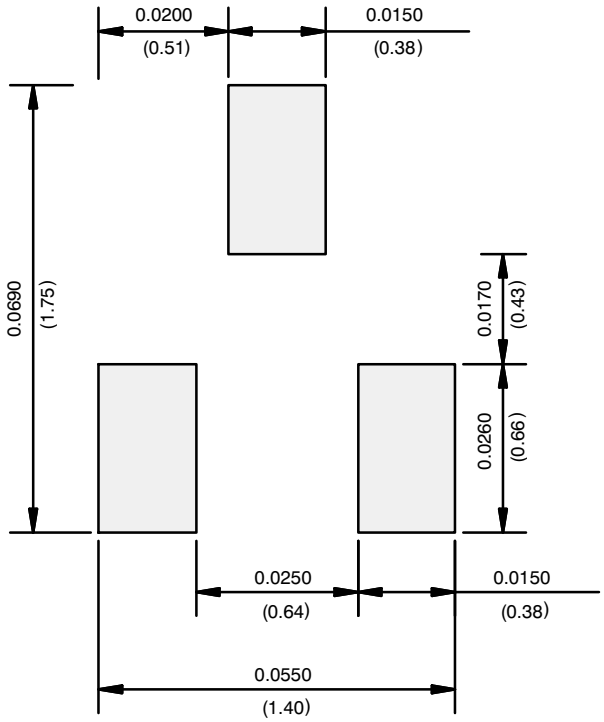
## SC89-3




| Dim | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.60 | 0.80 | 0.024 | 0.031 |
| b | 0.23 | 0.33 | 0.009 | 0.013 |
| C | 0.10 | 0.20 | 0.004 | 0.008 |
| D | 1.50 | 1.70 | 0.059 | 0.067 |
| E | 0.75 | 0.95 | 0.030 | 0.037 |
| e | 1.00 BSC | | 0.040 BSC | |
| $e_1$ | 0.50 BSC | | 0.020 BSC | |
| H | 1.50 | 1.70 | 0.059 | 0.067 |
| L | 0.30 | 0.50 | 0.012 | 0.020 |

ECN: S-03946—Rev. B, 09-Jul-01
DWG: 5869

**RECOMMENDED MINIMUM PADS FOR SC-89: 3-Lead**




Recommended Minimum Pads
Dimensions in Inches/(mm)

Return to Index

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**Üreticileri görün**

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